Appendix 2

Comparative effectiveness of various physical exercise interventions on executive functions and related symptoms in children and adolescents with attention deficit hyperactivity disorder: A systematic review and network meta-analysis

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S1. Updated protocol

Table S1 Protocol deviations

Section	Previous protocol	Update
Title	Comparative efficacy of physical activity modalities in children and adolescents with attention deficit/hyperactivity disorder: A systematic review and network meta-analysis	Comparative effectiveness of various physical exercise interventions on executive functions and related symptoms in children and adolescents with attention deficit hyperactivity disorder: A systematic review and network meta-analysis
Authors	Feilong Zhu, Xiaotong Zhu, Yu Wu, Xiaoyu Bi, Dongqing Kuang, Yuanchun Ren	Feilong Zhu, Xiaotong Zhu, Xiaoyu Bi, Dongqing Kuang, Boya Liu, Jingyi Zhou, Yuanchun Ren
Search strategy	With no limitation on language and publication data, the databases for Web of Science, PubMed, Embase, Cochrane Central Register of Controlled Trials, SPORTDiscus, PEDro,	We searched the Web of Science, PubMed, Embase, Cochrane Central Register of Controlled Trials, SPORTDiscus, PsycINFO, CNKI and clinical trials databases without

	ScienceDirect, PsycINFO and ClinicalTrials.gov was searched.	restrictions on language.
Study quality assessment	Risk of bias was assessed by 2 authors according to the Cochrane Collaboration's risk-of-bias tool, which consists of seven items: random sequence generation, allocation concealment, blinding of participants and personnel, blinding of outcome assessors, incomplete outcome data, incomplete outcome reporting, and other bias.	The methodological quality of included randomized controlled trials and non-randomized controlled studies was assessed by 2 reviewers using the Physiotherapy Evidence Database scale (PEDro).
Data synthesis	No meta regression analysis.	We also conducted meta regression analysis (with frequency, intensity, duration, and length of PA interventions as covariates) for the primary outcomes.

S2. Search strategy

PubMed 549

#1 "Attention Deficit Disorder with Hyperactivity"[Mesh] OR Attention Deficit Disorders with Hyperactivity[tiab] OR Attention Deficit Hyperactivity Disorder*[tiab] OR Hyperkinetic Syndrome*[tiab] OR ADDH[tiab] OR ADHD[tiab] OR Attention Deficit Disorder*[tiab] OR ADD[tiab] OR Hyperactivit*[tiab] OR Inattenti*[tiab] OR Impulsivit*[tiab] OR attention-deficit hyperactivity disorder*[tiab] OR Attention Deficit-Hyperactivity Disorder*[tiab] OR Hyperkinet*[tiab] OR Overactive*[tiab]

#2 "Exercise"[Mesh] OR "Sports"[Mesh] OR Exercise*[tiab] OR Physical Activit*[tiab] OR Physical Exercise*[tiab] OR Isometric Exercise*[tiab] OR Aerobic Exercise*[tiab] OR Exercise Training*[tiab] OR Sport*[tiab] OR Movement[tiab] OR Workout*[tiab] OR Physical Training*[tiab] OR Energy expenditure[tiab] OR Athletic*[tiab] OR Acute Exercise*[tiab] OR Chronic Exercise*[tiab] OR Exercise intervention[tiab] OR Intervention* [tiab] OR Training*[tiab] OR Program[tiab] OR Physical education[tiab] OR Locomotor Activit*[tiab] OR Physical therap*[tiab] OR motor activit*[tiab] OR Soccer[tiab] OR Swim*[tiab] OR Aquatic*[tiab] OR Div*[tiab] OR Football[tiab] OR Pin pang[tiab] OR Ping-pong[tiab] OR Ping pang[tiab] OR Basketball[tiab] OR Cricket[tiab] OR Tennis[tiab] OR Rugby[tiab] OR Danc*[tiab] OR Martial art*[tiab] OR Netball[tiab] OR Hockey[tiab] OR Gym*[tiab] OR Horse rid*[tiab] OR Horseback rid*[tiab] OR Equestrian[tiab] OR Baseball[tiab] OR Yoga[tiab] OR Badminton[tiab] OR Taekwondo[tiab] OR Judo[tiab] OR Cycling[tiab] Physical fitness[tiab] OR Fitness[tiab] OR Resistance exercise[tiab] OR Bicycling[tiab] OR Boxing[tiab] OR Golf[tiab] OR Tai Ji[tiab] OR

Mountaineering[tiab] OR Racquet sports[tiab] OR Skating[tiab] OR Snow sports skiing[tiab] OR Wrestling[tiab] OR Weight lifting[tiab] OR Games recreational[tiab] OR Weight bearing exercise[tiab] OR Strength training[tiab] OR Running[tiab] OR Agility[tiab] OR Trampoline[tiab] OR Snowshoeing[tiab] OR Skating[tiab] OR Exergaming[tiab] OR Skateboarding[tiab] OR Walking[tiab] OR Treadmill[tiab]

#3 "Child"[Mesh] OR "Adolescent"[Mesh] OR "Young Adult"[Mesh] OR "Minor"[Mesh] OR Adolescen*[tiab] OR Teen*[tiab] OR Teenager*[tiab] OR Youth*[tiab] OR "Minors"[tiab] OR Minor*[tiab] OR "Child"[tiab] OR Child*[tiab] OR Kid[tiab] OR Kids[tiab] OR Girl*[tiab] OR Boy*[tiab] OR Under age*[tiab] OR Underage*[tiab] OR Young people[tiab] OR young person[tiab] OR Prepubescen*[tiab] OR Pubescen*[tiab] OR Young Adult*[tiab] OR School age[tiab] OR Preschool*[tiab] OR Student*[tiab]

#4 #1 AND #2 AND #3

Web of Science 6236

#1 TS = (“Attention Deficit Disorder with Hyperactivit*” OR “attention-deficit hyperactivity disorder*” OR “attention deficit disorder*” OR “ADHD” OR adhd OR addh OR add OR “Attention Deficit Disorder* with Hyperactivity” OR “Attention Deficit Hyperactivity Disorder*” OR “Attention Deficit-Hyperactivity Disorder*” OR “attention deficit disorder hyperactivity” OR “attention deficit” OR “child attention deficit disorder” OR hyperactiv* OR “Hyperkinetic Syndrome*” OR “syndrome* hyperkinetic” OR “hyperkinetic syndrome childhood” OR “attention deficit hyperkinetic disorder” OR “hyperkinetic disorder” OR hyperkinet* OR overactive* OR “overactive child syndrome” OR

inattenti* OR “attention problem*” OR “syndrome hyperkinetic” OR “hyperkinetic syndrome” OR “hyperactivity disorder” OR “hyperactive child syndrome” OR “childhood hyperkinetic syndrome”)

#2 TS = (Attention Deficit Disorder with Hyperactivity)

#3 TS = (Sport* OR Exercis* OR “Locomotor Activit*” OR “Physical* therap*” OR “physical* activit*” OR “motor activit*” OR Soccer OR Swim* OR Aquatic* OR Dive OR Diving OR Football OR Pin pang OR Ping-pong OR Ping pang OR Basketball OR Cricket OR Tennis OR Rugby OR Danc* OR Athletic* OR “Martial art*” OR Netball OR Hockey OR Gym* OR “horse rid*” OR “horseback rid*” OR Equestrian OR Baseball OR Yoga OR Badminton OR Taekwondo OR Danc* OR Judo OR Cycling)

#4 TS = (Sports OR Exercise)

#5 TS=(Child OR Adolescent OR Young Adult OR Minor OR Adolescen* OR Teen* OR Teenager* OR Youth* OR Minors OR Minor* OR Child* OR Kid OR Kids OR Girl* OR Boy* OR Under age* OR Underage* OR Young people OR young person OR Prepubescen* OR Pubescen* OR Young Adult* OR School age OR Preschool* OR Student*)

#6 TS = (Child OR Adolescent OR Young Adult OR Minor)

#7 #1 OR #2

#8 #3 OR #4

#9 #5 OR #6

#10 #7 AND #8 AND#9

Cochrane Library 1164

#1 (Attention Deficit Disorder with Hyperactivit* OR attention-deficit hyperactivity disorder* OR attention deficit disorder* OR ADHD OR adhd OR addh OR add OR Attention Deficit Disorder* with Hyperactivity OR Attention Deficit Hyperactivity Disorder* OR Attention Deficit-Hyperactivity Disorder* OR attention deficit disorder hyperactivity OR attention deficit" OR child attention deficit disorder OR hyperactiv* OR Hyperkinetic Syndrome* OR syndrome* hyperkinetic OR hyperkinetic syndrome childhood OR attention deficit hyperkinetic disorder OR hyperkinetic disorder OR hyperkinet* OR overactive* OR "overactive child syndrome OR inattenti* OR attention problem* OR syndrome hyperkinetic OR hyperkinetic syndrome OR hyperactivity disorder OR hyperactive child syndrome OR childhood hyperkinetic syndrome): ti, ab, kw

#2 Attention Deficit Disorder with Hyperactivity [Mesh]

#3 (Sport* OR Exercis* OR "Locomotor Activit*" OR "Physical* therap*" OR "physical* activit*" OR "motor activit*" OR Soccer OR Swim* OR Aquatic* OR Dive OR Diving OR Football OR Pin pang OR Ping-pong OR Ping pang OR Basketball OR Cricket OR Tennis OR Rugby OR Danc* OR Athletic* OR "Martial art*" OR Netball OR Hockey OR Gym* OR "horse rid*" OR "horseback rid*" OR Equestrian OR Baseball OR Yoga OR Badminton OR Taekwondo OR Danc* OR Judo OR Cycling): ti, ab, kw

#4 Sports [Mesh]

#5 Exercise [Mesh]

#6 (Child OR Adolescent OR Young Adult OR Minor OR Adolescen* OR Teen* OR Teenager* OR Youth* OR Minors OR Minor* OR Child* OR Kid OR Kids OR Girl* OR Boy* OR Under age* OR Underage* OR Young people OR young

person OR Prepubescen* OR Pubescen* OR Young Adult* OR School age OR Preschool* OR Student*): ti, ab, kw

#7 Child [Mesh] OR Adolescent [Mesh] OR Young Adult [Mesh] OR Minor [Mesh]

#8 #1 OR #2

#9 #3 OR #4 OR #5

#10 #6 OR #7

#11 #8 AND #9 AND #10

Embase 2653

#1 'attention deficit disorder with hyperactivit*' OR 'attention-deficit hyperactivity disorder*' OR 'attention deficit disorder*' OR 'adhd' OR adhd OR addh OR add OR 'attention deficit disorder* with hyperactivity' OR 'attention deficit hyperactivity disorder*' OR 'attention deficit-hyperactivity disorder*' OR 'attention deficit disorder hyperactivity' OR 'attention deficit' OR 'child attention deficit disorder' OR hyperactiv* OR 'hyperkinetic syndrome*' OR 'syndrome* hyperkinetic' OR 'hyperkinetic syndrome childhood' OR 'attention deficit hyperkinetic disorder' OR 'hyperkinetic disorder' OR hyperkinet* OR overactive* OR 'overactive child syndrome' OR inattenti* OR 'attention problem*' OR 'syndrome hyperkinetic' OR 'hyperkinetic syndrome' OR 'hyperactivity disorder' OR 'hyperactive child syndrome' OR 'childhood hyperkinetic syndrome'

#2 'attention deficit disorder'/exp

#3 sport* OR exercis* OR 'locomotor activit*' OR 'physical* therap*' OR 'physical* activit*' OR 'motor activit*' OR soccer OR swim* OR aquatic* OR dive OR

diving OR football OR ‘pin pang’ OR ‘ping pong’ OR ‘ping pang’ OR basketball OR cricket OR tennis OR rugby OR athletic* OR ‘martial art*’ OR netball OR hockey OR gym* OR ‘horse rid*’ OR ‘horseback rid*’ OR equestrian OR baseball OR yoga OR badminton OR taekwondo OR danc* OR judo OR cycling

#4 ‘sport’/exp

#5 ‘exercise’/exp

#6 Child OR Adolescent OR Young Adult OR Minor OR Adolescen* OR Teen* OR Teenager* OR Youth* OR Minors OR Minor* OR Child* OR Kid OR Kids OR Girl* OR Boy* OR Under age* OR Underage* OR Young people OR young person OR Prepubescen* OR Pubescen* OR Young Adult* OR School age OR Preschool* OR Student*

#7 ‘Child’/exp

#8 ‘Adolescent’/exp

#9 #1 OR #2

#10 #3 OR #4 OR #5

#11 #6 OR #7 OR #8

#12 #9 AND #10 AND #11

SPORTDiscus 1765

#1 DE “Attention Deficit Disorder with Hyperactivity”

#2 (“Attention Deficit Disorder with Hyperactivit*” OR “attention-deficit hyperactivity disorder*” OR “attention deficit disorder*” OR “ADHD” OR adhd OR addh OR add OR “Attention Deficit Disorder* with Hyperactivity” OR

“Attention Deficit Hyperactivity Disorder*” OR “Attention Deficit-Hyperactivity Disorder*” OR “attention deficit disorder hyperactivity” OR “attention deficit” OR “child attention deficit disorder” OR hyperactiv* OR “Hyperkinetic Syndrome*” OR “syndrome* hyperkinetic” OR “hyperkinetic syndrome childhood” OR “attention deficit hyperkinetic disorder” OR “hyperkinetic disorder” OR hyperkinet* OR overactive* OR “overactive child syndrome” OR inattenti* OR “attention problem*” OR “syndrome hyperkinetic” OR “hyperkinetic syndrome” OR “hyperactivity disorder” OR “hyperactive child syndrome” OR “childhood hyperkinetic syndrome”). TX

#3 DE “Sports”

#4 DE “Exercise”

#5 (Sport* OR Exercis* OR “Locomotor Activit*” OR “Physical* therap*” OR “physical* activit*” OR “motor activit*” OR Soccer OR Swim* OR Aquatic* OR Dive OR Diving OR Football OR Pin pang OR Ping-pong OR Ping pang OR Basketball OR Cricket OR Tennis OR Rugby OR Danc* OR Athletic* OR “Martial art*” OR Netball OR Hockey OR Gym* OR “horse rid*” OR “horseback rid*” OR Equestrian OR Baseball OR Yoga OR Badminton OR Taekwondo OR Danc* OR Judo OR Cycling). TX

#6 DE “Child”

#7 DE “Adolescent”

#8 (Child OR Adolescent OR Young Adult OR Minor OR Adolescen* OR Teen* OR Teenager* OR Youth* OR Minors OR Minor* OR Child* OR Kid OR Kids OR Girl* OR Boy* OR Under age* OR Underage* OR Young people OR young person OR Prepubescen* OR Pubescen* OR Young Adult* OR School age OR Preschool* OR Student*). TX

#9 #1 OR #2

#10 #3 OR #4 OR #5

#11 #6 OR #7 OR #8

#12 #9 AND #10 AND #11

PsycINFO 3042

#1 "Attention Deficit Disorder with Hyperactivity" OR Attention Deficit Disorders with Hyperactivity OR Attention Deficit Hyperactivity Disorder* OR Hyperkinetic Syndrome* OR ADDH OR ADHD OR Attention Deficit Disorder* OR ADD OR Hyperactivit* OR Inattenti* OR Impulsivit* OR attention-deficit hyperactivity disorder* OR Attention Deficit-Hyperactivity Disorder* OR Hyperkinet* OR Overactive*

#2 Exercise OR Sports OR Exercise* OR Physical Activit* OR Physical Exercise* OR Isometric Exercise* OR Aerobic Exercise* OR Exercise Training* OR Sport* OR Movement OR Workout* OR Physical Training* OR Energy expenditure OR Athletic* OR Acute Exercise* OR Chronic Exercise* OR Exercise intervention OR Intervention* OR Training* OR Program OR Physical education OR Locomotor Activit* OR Physical therap* OR motor activit* OR Soccer OR Swim* OR Aquatic* OR Div* OR Football OR Pin pang OR Ping-pong OR Ping pang OR Basketball OR Cricket OR Tennis OR Rugby OR Danc* OR Martial art* OR Netball OR Hockey OR Gym* OR Horse rid* OR Horseback rid* OR Equestrian OR Baseball OR Yoga OR Badminton OR Taekwondo OR Judo OR Cycling Physical fitness OR Fitness OR Resistance exercise OR Bicycling OR Boxing OR Golf OR Tai Ji OR Mountaineering OR Racquet sports OR Skating OR Snow sports skiing OR Wrestling OR Weight lifting OR Games recreational

OR Weight bearing exercise OR Strength training OR Running OR Agility OR Trampoline OR Snowshoeing OR Skating OR Exergaming OR Skateboarding OR Walking OR Treadmill

#3 Child OR Adolescent OR "Young Adult" OR Minor OR Adolescen* OR Teen* OR Teenager* OR Youth* OR "Minors" OR Minor* OR "Child" OR Child* OR Kid OR Kids OR Girl* OR Boy* OR Under age* OR Underage* OR Young people OR young person OR Prepubescen* OR Pubescen* OR Young Adult* OR School age OR Preschool* OR Student*

#4 #1 AND #2 AND #3

S3. The inter-rater agreement for selecting studies

Table S2 The inter-rater agreement for reading the title and abstract

Reviewer 1	Reviewer 2			Total
	Exclude	Include	Unclear	
Exclude	13514	8	11	13533
Include	9	78	8	95
Unclear	14	6	10	30
Total	13537	92	29	13658

Kappa score: 0.77 (0.72-0.83)

Table S3 The inter-rater agreement for full-text review

Reviewer 1	Reviewer 2			Total
	Exclude	Include	Unclear	
Exclude	67	1	3	71
Include	1	54	0	55
Unclear	2	2	0	4
Total	70	57	3	130

Kappa score: 0.87 (0.79-0.95)

S4. Study quality assessment

Table S4 Quality assessment for RCTs and quasi-RCTs

Reference	Item 1	Item 2	Item 3	Item 4	Item 5	Item 6	Item 7	Item 8	Item 9	Item 10	Item 11	Score
Messler et al. (2018)	1	1	0	1	0	0	0	1	1	1	1	6/10
Benzing et al. (2019)	1	1	0	1	0	0	0	1	1	1	1	6/10
Bustamante et al. (2016)	1	1	0	1	0	0	0	1	1	1	1	6/10
Chang et al. (2014)	1	0	0	1	0	0	0	1	1	1	1	5/10
Choi et al. (2015)	1	1	0	1	0	0	0	1	1	1	1	6/10
Chou et al. (2017)	1	0	0	1	0	0	0	1	1	1	1	5/10
Faramarzi et al. (2016)	1	1	0	1	0	0	0	1	1	1	1	6/10
Gelade et al. (2017)	1	1	0	1	1	0	1	1	1	1	1	8/10
Kadri et al. (2019)	1	1	0	1	0	0	0	1	1	1	1	6/10
Lee et al. (2017)	1	1	0	1	0	0	0	1	1	1	1	6/10
Memarmoghaddam et al. (2016)	1	1	0	1	0	0	0	1	1	1	1	6/10
Pan et al. (2016)	1	1	0	1	0	0	0	1	1	1	1	6/10
Pan et al. (2019)	1	0	0	1	0	0	0	1	1	1	1	5/10
Rezaei et al. (2018)	1	1	0	1	0	0	0	1	1	1	1	6/10
Silva et al. (2020)	1	1	0	1	0	0	0	0	1	1	1	5/10
Smith et al. (2020)	1	1	0	1	0	0	0	1	1	1	1	6/10
Verret et al. (2012)	1	0	0	1	0	0	0	1	1	1	1	5/10
Ziereis et al. (2015)	1	1	0	1	0	0	0	1	1	1	1	6/10
Benzing et al. (2018)	1	1	0	1	1	0	0	1	1	1	1	7/10
Chang et al. (2012)	1	1	0	1	0	0	0	1	1	1	1	6/10

Reference	Item 1	Item 2	Item 3	Item 4	Item 5	Item 6	Item 7	Item 8	Item 9	Item 10	Item 11	Score
Gawrilow et al. (2013)	1	1	0	1	0	0	0	1	1	1	1	6/10
Kang et al. (2011)	1	1	0	1	0	0	0	1	1	1	1	6/10
Chang et al. (2022)	1	1	0	1	0	0	0	1	1	1	1	6/10
Smith et al. (2019)	1	1	0	1	0	0	0	1	1	1	1	6/10
Ahmed et al. (2011)	1	1	0	1	0	0	0	1	1	1	1	6/10
Hattabi et al. (2019)	1	1	0	1	0	0	0	1	1	1	1	6/10
Hoza et al. (2014)	1	1	0	1	1	0	0	1	1	1	1	7/10
Jensen et al. (2004)	1	1	0	1	0	0	0	1	1	1	1	6/10
Garcia-Gomez et al. (2016)	1	0	0	1	0	0	0	1	1	1	1	5/10
Porter et al. (1984)	1	1	0	1	0	0	0	0	1	1	1	5/10
Oh et al. (2018)	1	1	0	1	0	0	0	1	1	1	1	6/10
Liu et al. (2018)	1	1	0	1	0	0	0	1	1	1	1	6/10
Bahram et al. (2014)	1	1	0	1	0	0	0	1	1	1	1	6/10
Hattabi et al. (2021)	1	0	0	0	0	0	0	1	1	1	1	4/10
Felmet et al. (1998)	1	1	0	1	0	0	0	1	1	1	1	5/10
Gelade et al. (2018)	1	1	1	1	0	0	0	1	1	1	1	7/10
Soori et al. (2020)	1	1	0	1	0	0	0	1	1	1	1	6/10
Song et al. (2022)	1	1	0	1	0	0	0	1	1	1	1	6/10
Chen et al. (2022)	1	1	0	1	0	0	0	1	1	1	1	6/10
Xu et al. (2021)	1	1	0	1	0	0	0	1	1	1	1	6/10
Chuang et al. (2015)	1	1	0	1	0	0	0	1	1	1	1	6/10
Ludyga et al. (2020)	1	1	0	1	0	0	0	1	1	1	1	6/10

Reference	Item 1	Item 2	Item 3	Item 4	Item 5	Item 6	Item 7	Item 8	Item 9	Item 10	Item 11	Score
Silva et al. (2015)	1	0	0	1	0	0	0	1	1	1	1	5/10
Liang et al. (2022)	1	1	0	1	0	0	0	1	1	1	1	6/10

Item1, eligibility criteria; Item 2, random allocation; Item 3, concealed allocation; Item 4, baseline comparability; Item 5, blind subjects; Item 6, blind therapists; Item 7, blind assessors; Item 8, adequate follow-up; Item 9, intention-to-treat analysis; Item 10, between-group comparisons; Item 11, estimates and variability.

Table S5 Quality assessment for self-control trials

Reference	Item 1	Item 2	Item 3	Item 4	Item 5	Item 6	Item 7	Item 8	Item 9
So et al. (2017)	Yes	Unclear	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Hernandez-Reif et al. (2001)	Yes	NA	NA	No	Yes	Yes	Yes	Yes	Unclear
Lufi et al. (2011)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cuypers et al. (2011)	Yes	NA	NA	No	Yes	Yes	Yes	Yes	Yes
Jang et al. (2015)	Yes	NA	NA	No	Yes	Yes	Yes	Yes	Yes
Schoenfelder et al. (2017)	Yes	NA	NA	No	Yes	Yes	Yes	Yes	Yes
Siu et al. (2020)	Yes	NA	NA	No	Yes	Yes	Yes	Yes	Yes
Shema-Shiratzky et al. (2019)	Yes	NA	NA	No	Yes	Yes	Yes	Yes	Yes
Smith et al. (2013)	Yes	NA	NA	No	Yes	Yes	Yes	Yes	Yes
Pontifex et al. (2013)	Yes	No	NA	Yes	Yes	Yes	Yes	Yes	Yes
Piepmeier et al. (2015)	Yes	Yes	NA	Yes	Yes	Yes	Yes	Yes	Yes
Hung et al. (2016)	Yes	No	NA	Yes	Yes	Yes	Yes	Yes	Yes
Ludyga et al. (2017)	Yes	NA	NA	Yes	Yes	Yes	Yes	Yes	Yes
Craft et al. (1983)	Yes	NA	NA	No	No	Yes	Yes	Unclear	Unclear
McKune et al. (2003)	Yes	Unclear	Yes	Yes	No	Yes	Yes	Yes	Yes

Item 1, Were the causal relationships in the study clearly stated?

Item 2, Were the baselines comparable between groups?

Item 3, Were the groups receiving the same intervention besides to be validated?

Item 4, Was a control group set up?

Item 5, Were the outcome measures diversified before and after the intervention?

Item 6, Was follow-up complete and, if not, was loss to follow-up reported and addressed?

Item 7, Were the outcome measures used in the same way in each group?

Item 8, Were the outcomes measured in a valid and reliable way?

Item 9, Was appropriate statistical analysis used?

S5. Summary table of pairwise comparison results

Table S6 Direct comparison treatment effect with control group

Outcomes	Types	Trials	Participants	Effect size	I^2
Executive functions	Open-skill activities	4	110	1.94 [1.11, 2.77]	66.0
	Closed-skill activities	13	400	1.09 [0.63, 1.55]	77.0
	Multicomponent PA	10	355	0.74 [0.32, 1.17]	62.0
	Exergaming	3	129	0.56 [0.21, 0.92]	0
Hyperactivity/ impulsivity	Closed-skill activities	7	288	-1.84 [-2.67, -1.02]	81.0
	Multicomponent PA	2	115	0.16 [-0.21, 0.52]	0
	High-intensity interval training	1	43	-0.43 [-1.05, 0.19]	NA
	Exergaming	1	51	-0.28 [-0.83, 0.28]	NA
	Open-skill activities	1	14	-0.25 [-1.35, 0.85]	NA
Inattention	Closed-skill activities	5	184	-1.57 [-2.58, -0.57]	80.0
	High-intensity interval training	1	43	-0.43 [-1.05, 0.19]	NA
	Exergaming	1	51	-0.02 [-0.57, 0.53]	NA
	Multicomponent PA	3	209	0.03 [-0.24, 0.30]	0
	Open-skill activities	1	14	-0.24 [-1.33, 0.86]	NA

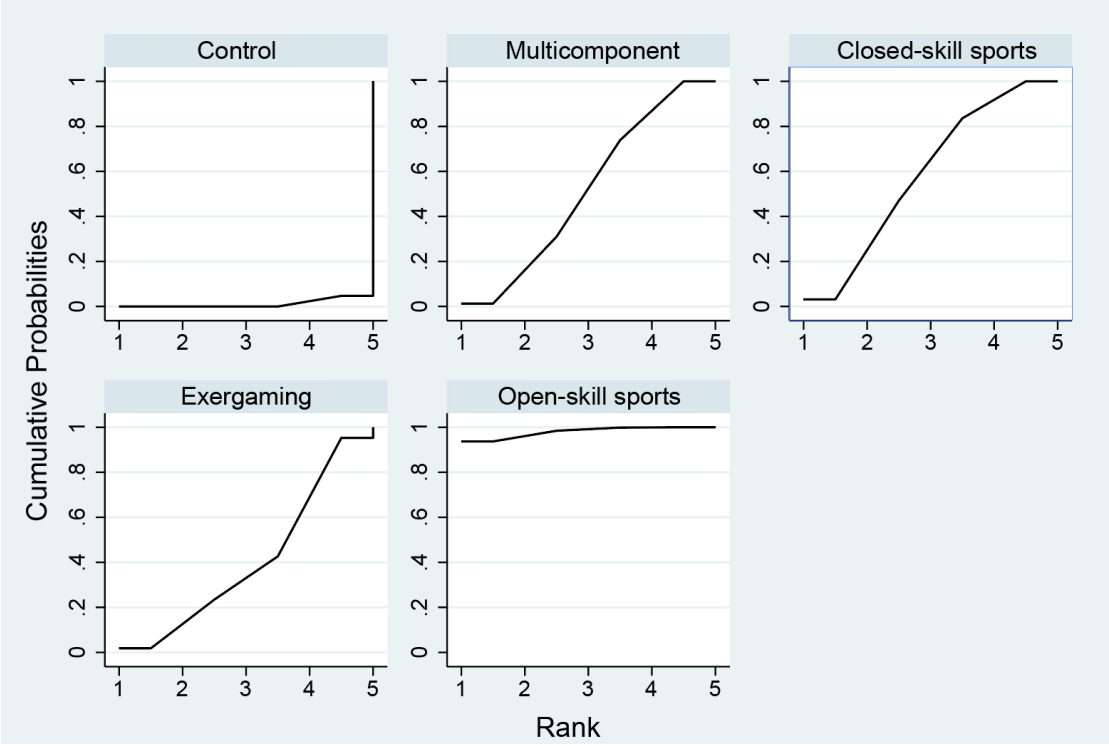
S6. Analysis for executive functions

Figure S1 Loop-specific heterogeneity for executive functions

Loop	IF	seIF	z_value	p_value	CI_95	Loop_Heterog_tau2
A-D-E	0.580	6.340	0.092	0.927	(0.00,13.01)	2.223
A-B-E	0.344	1.158	0.297	0.766	(0.00,2.61)	0.637
A-B-C	0.145	1.142	0.127	0.899	(0.00,2.38)	0.609

Inconsistency plot for the executive network, assuming loop-specific heterogeneity estimates.

Figure S2 The ranking of effects for executive functions



Plots of the surface under the cumulative ranking curves (SUCRA) for all comparisons in the executive functions network.

S7. Subgroup analysis for executive functions

Figure S3 Network of eligible comparisons for inhibitory control

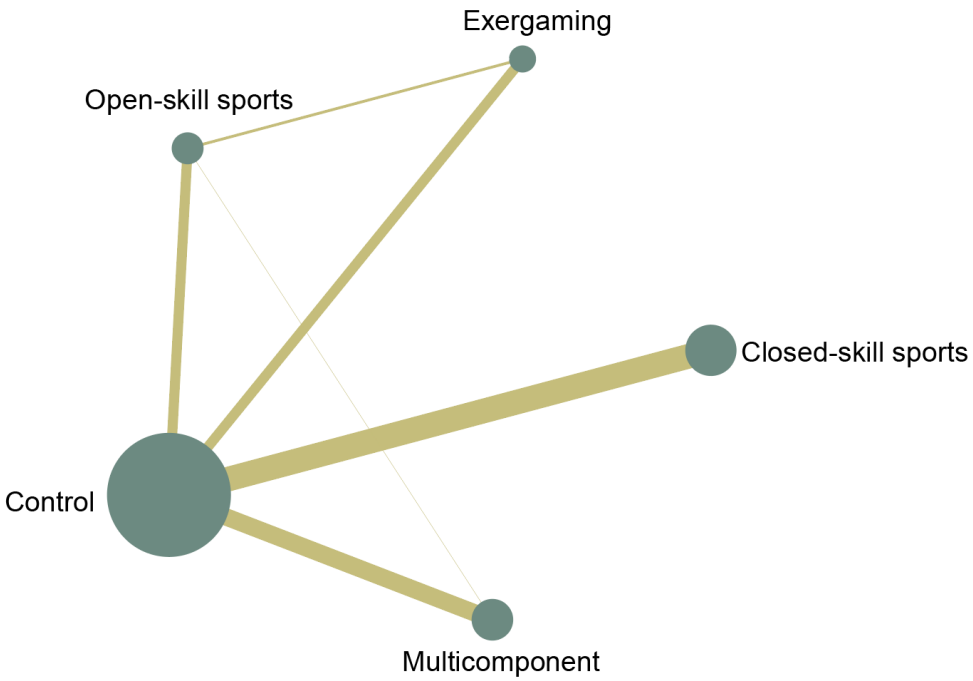
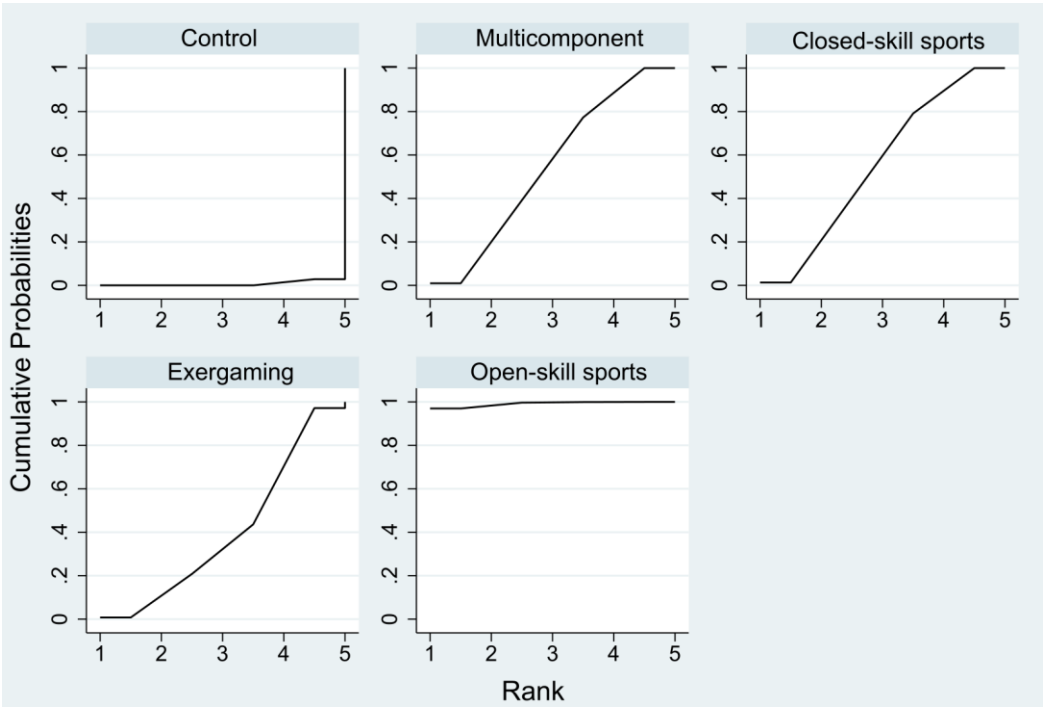


Figure S4 The ranking of effects for inhibitory control



Plots of the surface under the cumulative ranking curves (SUCRA) for all comparisons in the inhibitory control.

Figure S5 Relative effect sizes of treatments efficacy based on network meta-analysis for inhibitory control

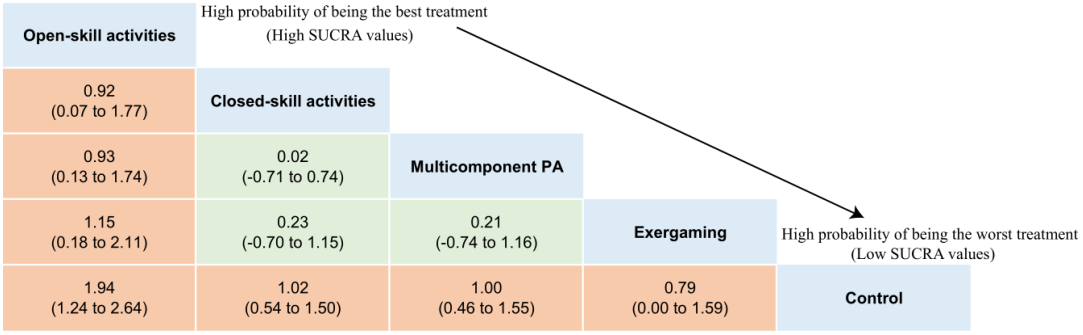


Figure S6 Loop-specific heterogeneity for inhibitory control

Loop	IF	seIF	z_value	p_value	CI_95	Loop_Heterog_tau2
A-D-E	0.580	6.340	0.092	0.927	(0.00,13.01)	2.223
A-B-E	0.398	1.013	0.393	0.694	(0.00,2.38)	0.512

Figure S7 Network of eligible comparisons for working memory

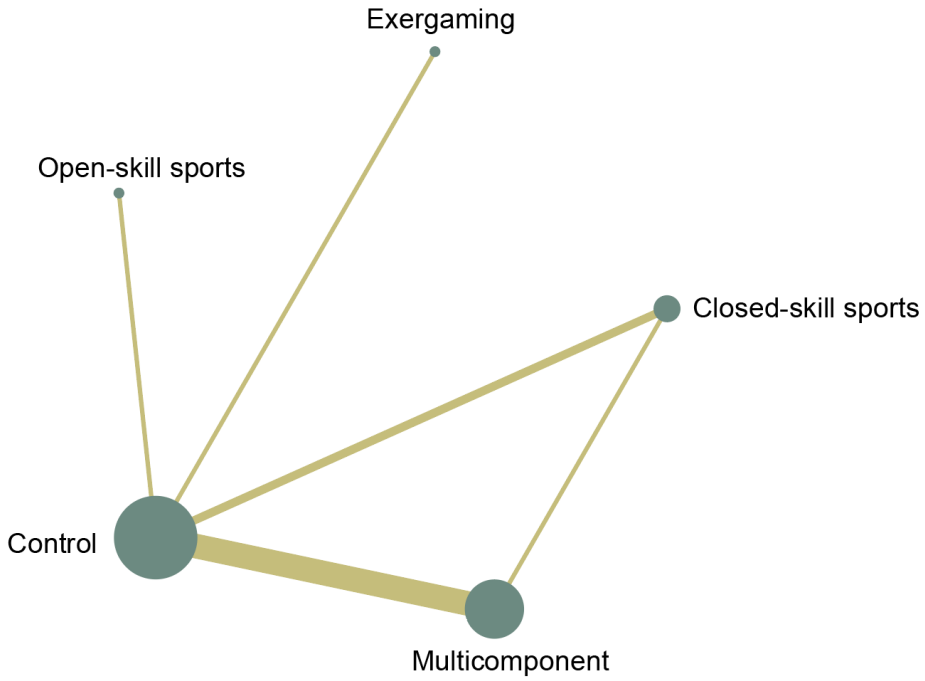
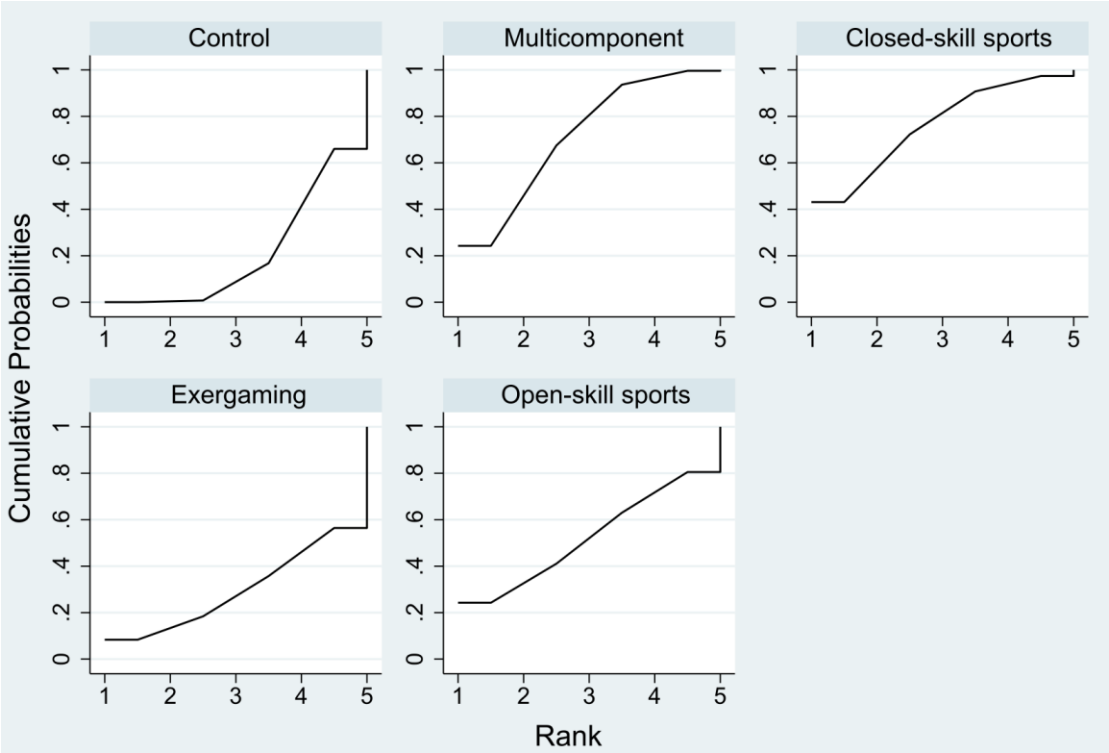


Figure S8 The ranking of effects for working memory



Plots of the surface under the cumulative ranking curves (SUCRA) for all comparisons in the working memory.

Figure S9 Relative effect sizes of treatments efficacy based on network meta-analysis for working memory

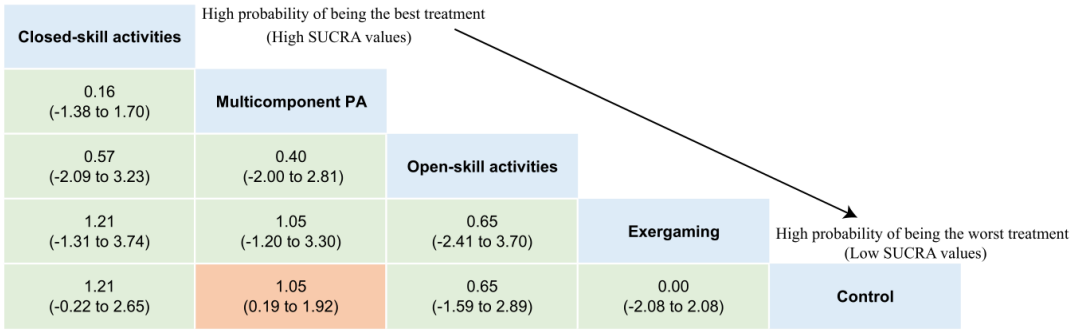


Figure S10 Loop-specific heterogeneity for working memory

Loop	IF	seIF	z_value	p_value	CI_95	Loop_Heterog_tau2
A-B-C	0.129	1.579	0.082	0.935	(0.00,3.22)	0.954

Figure S11 Network of eligible comparisons for cognitive flexibility

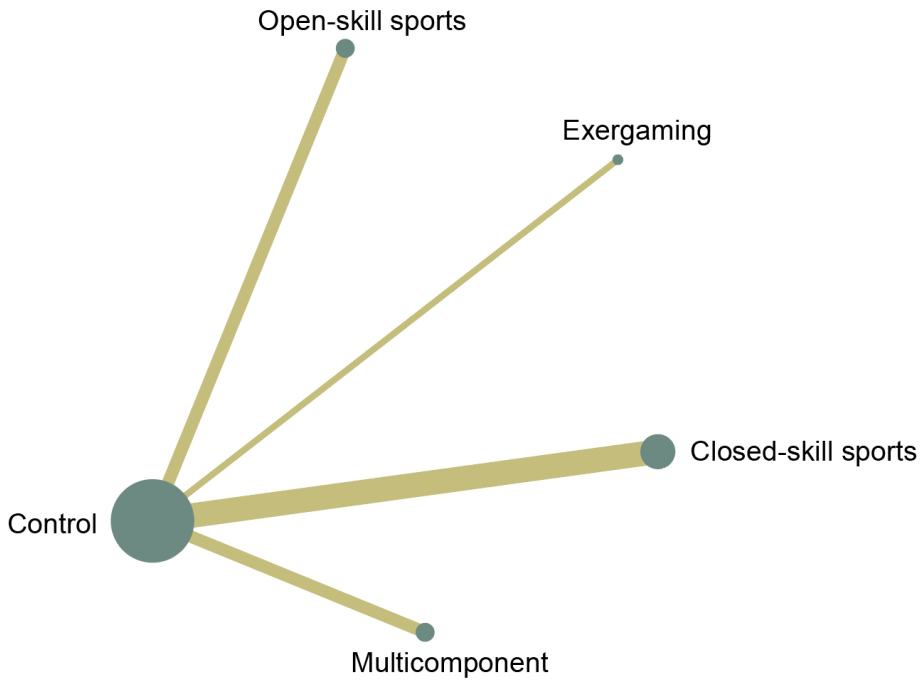
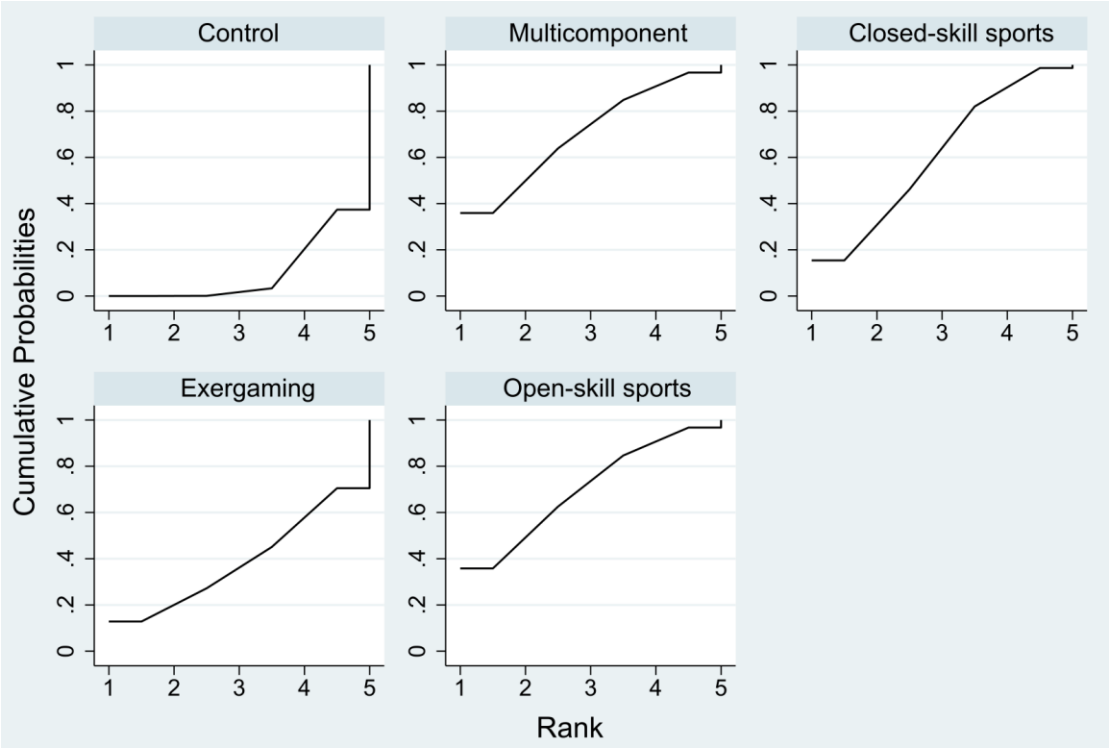
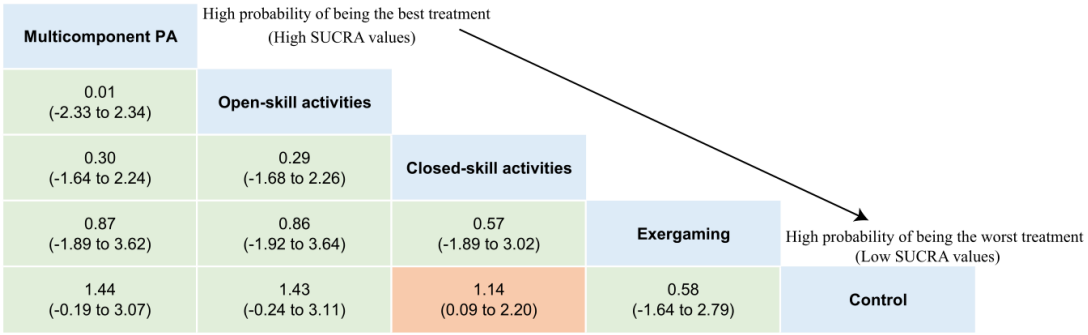


Figure S12 The ranking of effects for cognitive flexibility



Plots of the surface under the cumulative ranking curves (SUCRA) for all comparisons in the cognitive flexibility.

Figure S13 Relative effect sizes of treatments efficacy based on network meta-analysis for cognitive flexibility



S8. Publication bias assessed with funnel plots for executive functions

Figure S14 Comparison-adjusted funnel plot for the inhibitory control network

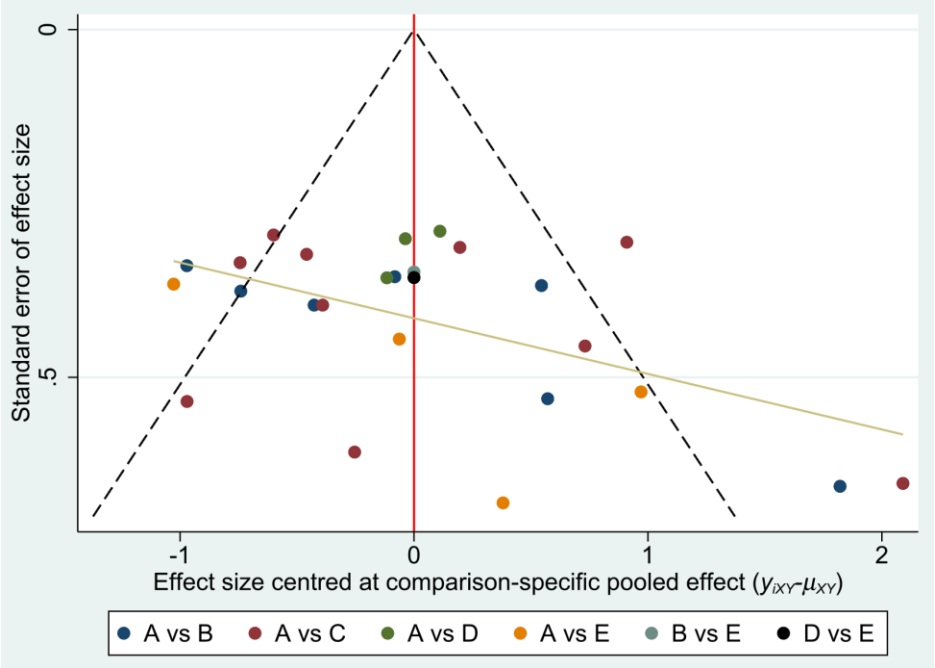


Figure S15 Comparison-adjusted funnel plot for the working memory network

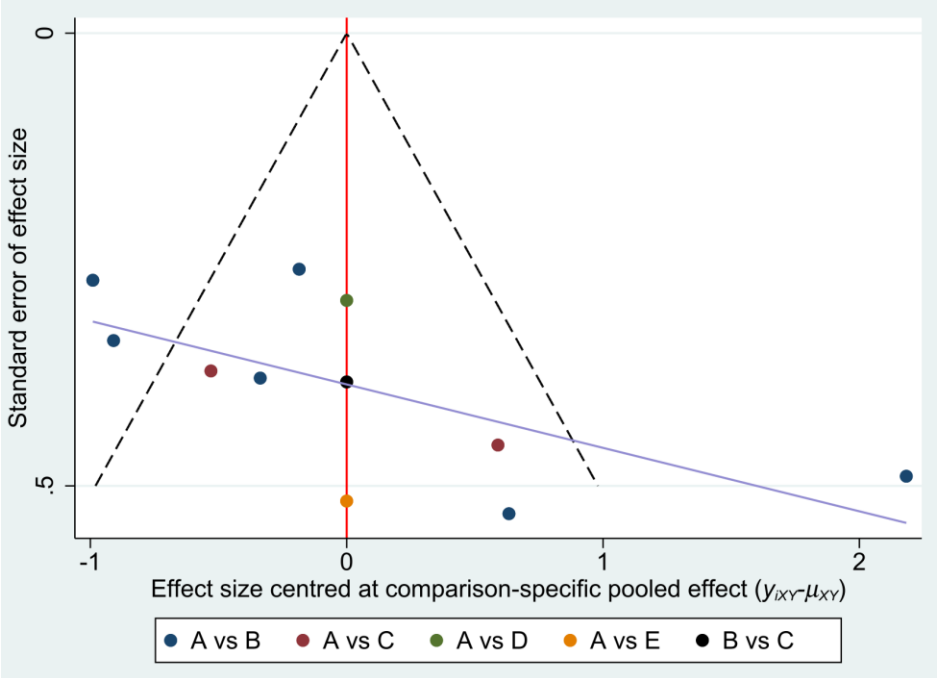
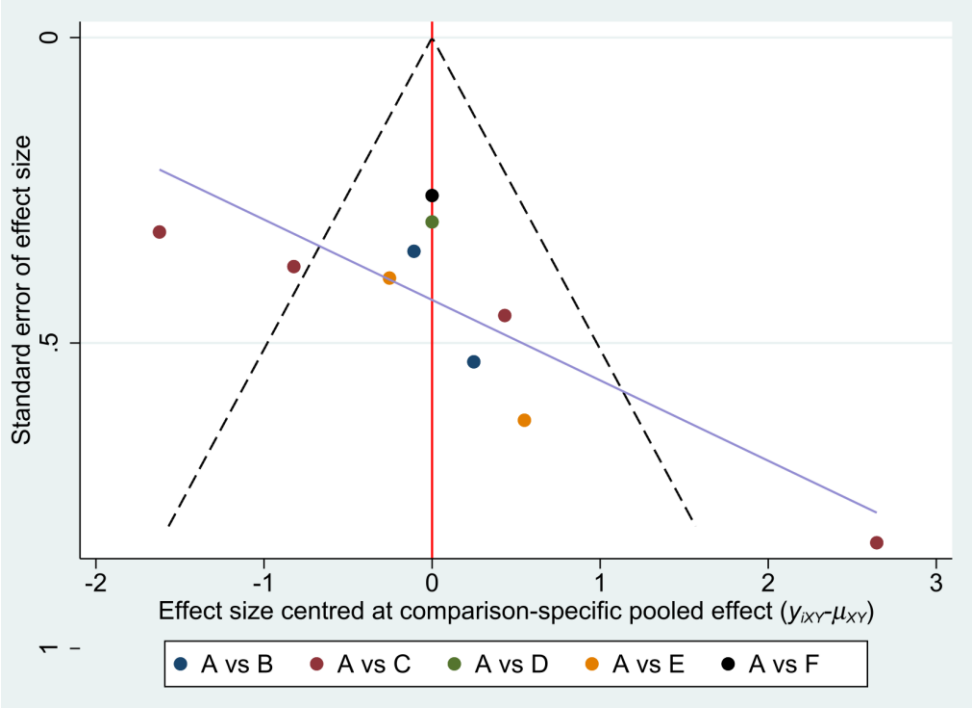


Figure S16 Comparison-adjusted funnel plot for the cognitive flexibility network



S9. Meta-regression analyses for executive functions

Figure S17 The results of meta-regression analyses for executive functions

1. Empirical mean and standard deviation for each variable, plus standard error of the mean:

	Mean	SD	Naive SE	Time-series SE
d.1.2	-5.486	33.26	0.07438	0.05904
d.1.3	-7.474	45.89	0.10261	0.07430
d.1.4	53.634	46.24	0.10339	0.21210
d.1.5	9.466	36.17	0.08089	0.24116
sd.d	72.784	14.20	0.03175	0.07296
beta[2]	61.152	147.28	0.32932	2.68689
beta[3]	-52.624	173.51	0.38797	2.48008
beta[4]	-46.523	90.23	0.20175	1.67674
beta[5]	22.289	40.41	0.09036	4.79158

2. Quantiles for each variable:

	2.5%	25%	50%	75%	97.5%
d.1.2	-65.21	-30.814	-7.270	20.44	56.64
d.1.3	-98.84	-40.537	-2.725	29.49	65.69
d.1.4	-37.48	23.302	53.691	83.77	145.33
d.1.5	-61.68	-14.519	9.587	33.49	80.22
sd.d	49.76	62.281	70.982	81.75	104.89
beta[2]	-177.90	-45.205	95.149	197.73	219.81
beta[3]	-303.22	-188.890	-29.329	95.77	153.45
beta[4]	-236.99	-101.322	-42.237	11.40	124.19
beta[5]	-58.43	-3.595	21.564	48.67	105.27

-- Model fit (residual deviance):

Dbar	pD	DIC
59.68413	59.57809	119.26222

60 data points, ratio 0.9947, I^2 = 1%

Frequency

1. Empirical mean and standard deviation for each variable, plus standard error of the mean:

	Mean	SD	Naive SE	Time-series SE
d.1.2	-2.721	41.73	0.09330	0.07622
d.1.3	-2.024	27.14	0.06068	0.05953
d.1.4	40.738	59.56	0.13317	0.42610
d.1.5	-10.005	62.37	0.13946	1.78242
sd.d	89.197	33.67	0.07530	0.06562
beta[2]	5.699	318.68	0.71259	1.77069
beta[3]	-170.018	110.94	0.24807	3.23154
beta[4]	-58.316	100.38	0.22445	1.96895
beta[5]	94.306	160.01	0.35778	29.53184

2. Quantiles for each variable:

	2.5%	25%	50%	75%	97.5%
d.1.2	-98.35	-25.333	5.762	22.180	70.03
d.1.3	-60.51	-18.640	1.577	14.638	49.71
d.1.4	-80.66	6.786	38.519	74.573	166.15
d.1.5	-151.59	-48.583	2.016	33.756	90.75
sd.d	25.62	67.176	106.098	114.188	116.81
beta[2]	-301.75	-184.538	-111.585	87.320	543.93
beta[3]	-292.94	-242.965	-203.325	-122.932	18.37
beta[4]	-271.10	-116.669	-55.308	3.941	135.93
beta[5]	-141.73	-21.680	52.870	184.445	453.49

-- Model fit (residual deviance):

Dbar	pD	DIC
59.32767	59.26679	118.59446

60 data points, ratio 0.9888, I^2 = 0.6%

Duration

1. Empirical mean and standard deviation for each variable, plus standard error of the mean:

	Mean	SD	Naive SE	Time-series SE
d.1.2	3.195	31.97	0.07149	0.11707
d.1.3	10.426	29.27	0.06545	0.06062
d.1.4	63.410	62.45	0.13965	0.83461
d.1.5	15.209	55.19	0.12341	2.51334
sd.d	92.756	28.64	0.06404	0.33395
beta[2]	-134.064	267.77	0.59875	1.93663
beta[3]	75.541	196.18	0.43866	10.31818
beta[4]	53.412	111.77	0.24992	5.12928
beta[5]	3.580	97.12	0.21717	27.90645

2. Quantiles for each variable:

	2.5%	25%	50%	75%	97.5%
d.1.2	-61.63	-15.889	3.581	21.574	69.81
d.1.3	-48.36	-6.985	10.090	27.180	72.30
d.1.4	-62.75	24.472	63.320	102.297	190.20
d.1.5	-96.90	-17.612	15.501	47.220	130.31
sd.d	33.73	76.440	107.970	114.201	116.78
beta[2]	-411.45	-335.930	-211.048	-6.783	304.15
beta[3]	-246.20	-32.453	100.148	174.012	373.85
beta[4]	-162.82	-14.318	49.465	117.996	284.31
beta[5]	-191.80	-55.466	2.781	50.791	234.38

-- Model fit (residual deviance):

Dbar	pD	DIC
60.12699	59.88563	120.01263

60 data points, ratio 1.002, I^2 = 2%

Intensity

1. Empirical mean and standard deviation for each variable, plus standard error of the mean:

	Mean	SD	Naive SE	Time-series SE
d.1.2	4.142	15.081	0.03372	0.1324
d.1.3	-37.369	17.006	0.03803	0.1546
d.1.4	31.759	31.463	0.07035	0.1480
d.1.5	14.099	22.664	0.05068	0.3777
sd.d	44.525	9.132	0.02042	0.1091
beta[2]	-210.405	153.631	0.34353	4.9610
beta[3]	-276.574	70.211	0.15700	6.5498
beta[4]	-126.473	155.298	0.34726	1.5388
beta[5]	-202.883	152.215	0.34036	1.4528

2. Quantiles for each variable:

	2.5%	25%	50%	75%	97.5%
d.1.2	-25.70	-5.6254	4.112	13.82	34.287
d.1.3	-74.11	-47.9211	-36.045	-25.53	-7.227
d.1.4	-29.45	11.1038	31.356	52.05	95.110
d.1.5	-30.69	-0.4763	14.030	28.55	59.342
sd.d	29.94	37.8359	43.479	50.08	64.947
beta[2]	-426.93	-343.7890	-212.081	-86.22	11.372
beta[3]	-404.87	-318.6580	-266.985	-215.57	-171.765
beta[4]	-488.60	-213.9582	-101.443	-19.37	122.065
beta[5]	-424.53	-339.7806	-211.227	-60.94	27.259

-- Model fit (residual deviance):

Dbar	pD	DIC
59.29099	58.70358	117.99458

60 data points, ratio 0.9882, I^2 = 0.5%

Length

S10. GRADE assessment for executive functions

Table S7 Summary of GRADE assessment for the certainty in executive functions

Comparisons	Nature of evidence	Certainty	Reason for downgrading
Open-skill sports vs. closed-skill sports	Indirect	Very low	Imprecision, indirectness
Open-skill sports vs. multicomponent	Mixed	Very low	Imprecision, inconsistency
Open-skill sports vs. exergaming	Mixed	Moderate	Risk of bias
Open-skill sports vs. control	Mixed	High	No downgrade
Closed-skill sports vs. multicomponent	Mixed	Low	Imprecision
Closed-skill sports vs. exergaming	Indirect	Low	Imprecision, indirectness
Closed-skill sports vs. control	Mixed	Moderate	Risk of bias
Multicomponent vs. exergaming	Indirect	Low	Imprecision, risk of bias
Multicomponent vs. control	Mixed	Moderate	Risk of bias
Exergaming vs. control	Mixed	Low	Imprecision, risk of bias

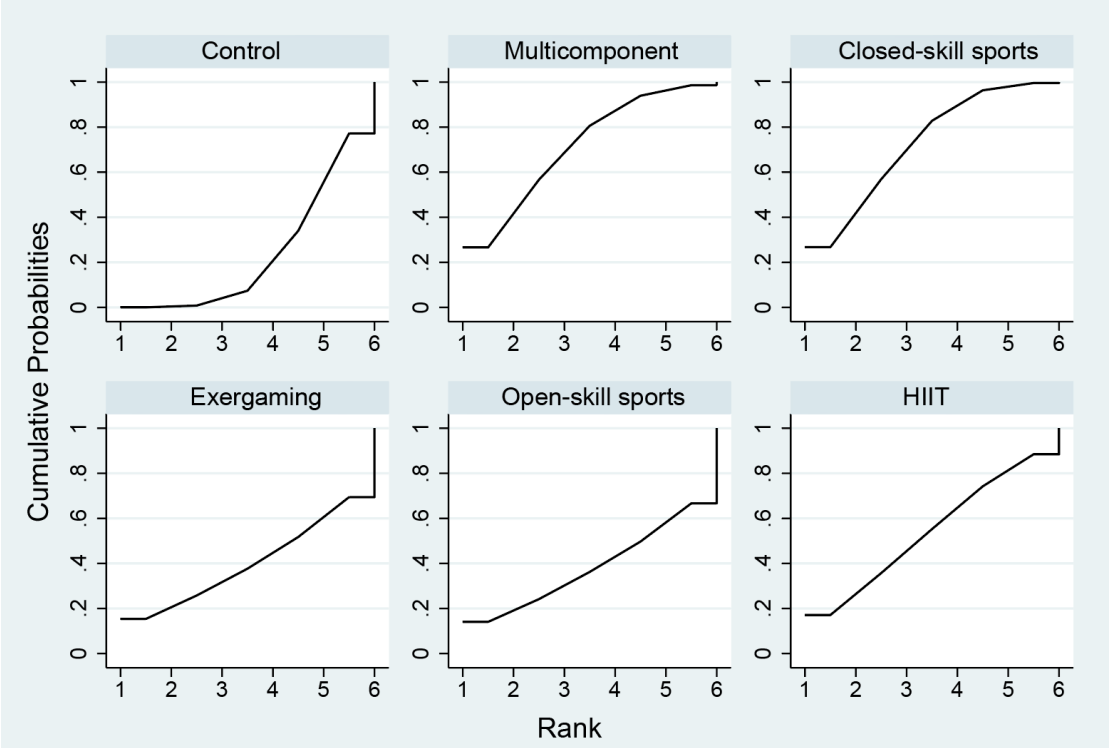
S11. Analysis for hyperactivity/impulsivity

Figure S18 Loop-specific heterogeneity for hyperactivity/impulsivity

Loop	IF	seIF	z_value	p_value	CI_95	Loop_Heterog_tau2
A-B-F	1.312	5.464	0.240	0.810	(0.00,12.02)	4.098

Inconsistency plot for the hyperactivity/impulsivity, assuming loop-specific heterogeneity estimates.

Figure S19 The ranking of effects for hyperactivity/impulsivity



Plots of the surface under the cumulative ranking curves (SUCRA) for all comparisons in the hyperactivity/impulsivity network.

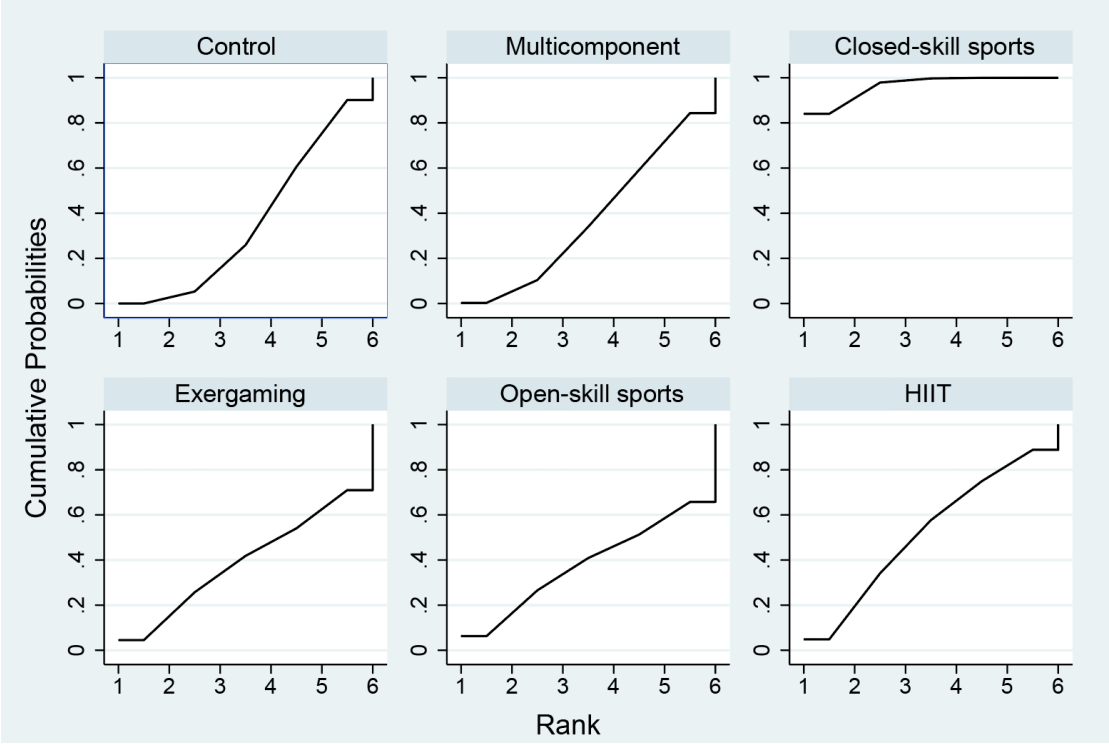
S12. Analysis for inattention

Figure S20 Loop-specific heterogeneity for inattention

Loop	IF	seIF	z_value	p_value	CI_95	Loop_Heterog_tau2
A-B-F	0.358	0.512	0.700	0.484	(0.00,1.36)	0.000

Inconsistency plot for the inattention, assuming loop-specific heterogeneity estimates.

Figure S21 The ranking of effects for inattention



Plots of the surface under the cumulative ranking curves (SUCRA) for all comparisons in the inattention network.

S13. Publication bias assessed with funnel plots for major symptoms

Figure S22 Comparison-adjusted funnel plot for the hyperactivity/impulsivity network

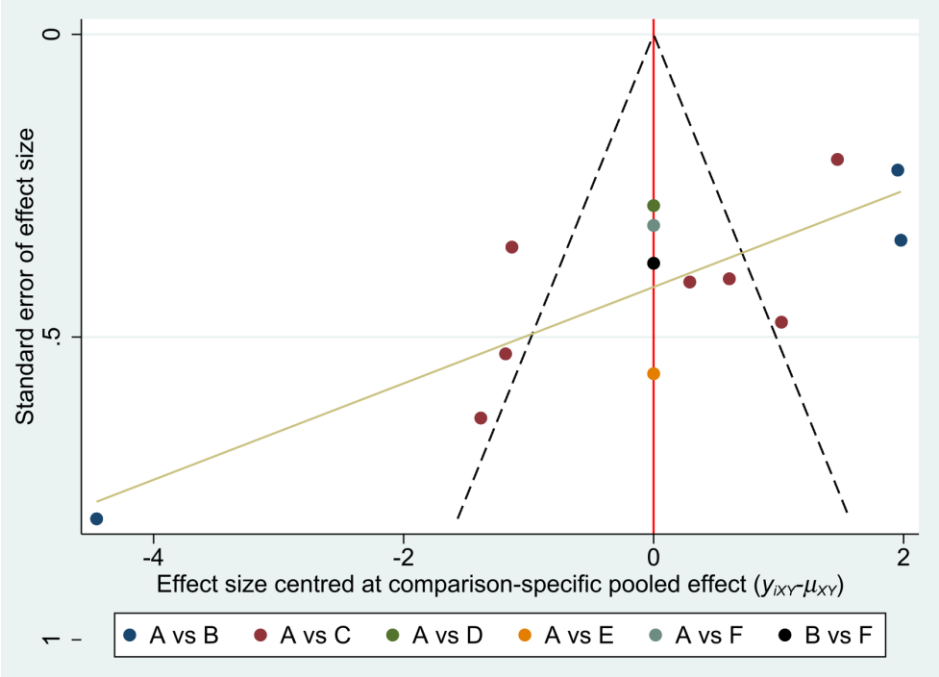
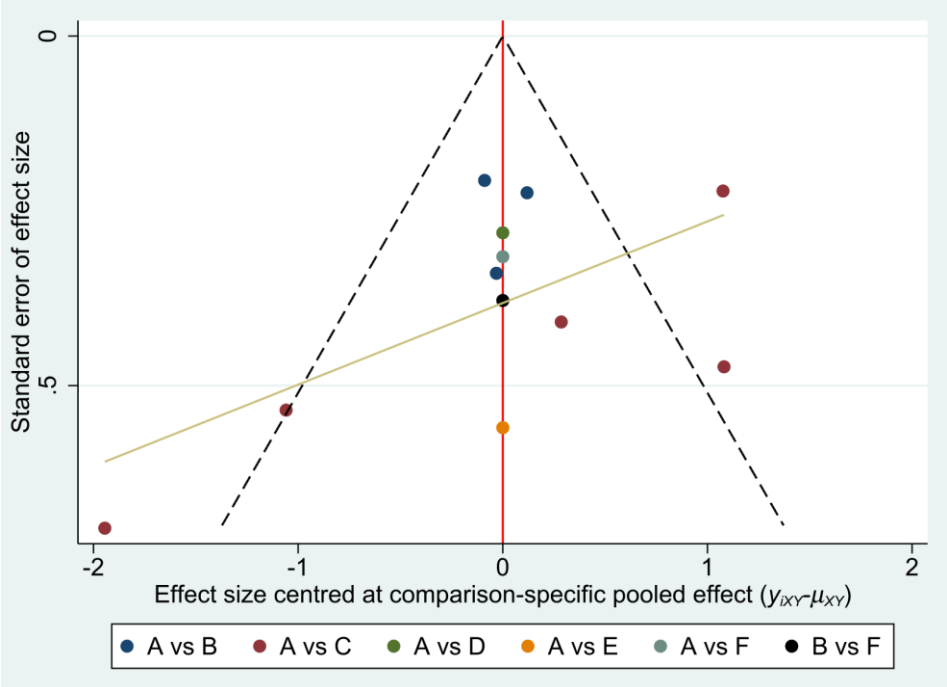


Figure S23 Comparison-adjusted funnel plot for the inattention network



S14. Meta-regression analyses for major symptoms

Figure S24 The results of meta-regression analyses for hyperactivity/impulsivity

1. Empirical mean and standard deviation for each variable, plus standard error of the mean:

	Mean	SD	Naive SE	Time-series SE
d.1.2	-0.5812	3.085	0.006899	0.021236
d.1.3	-5.4553	2.195	0.004908	0.006217
d.1.4	-1.5094	6.531	0.014604	0.103103
d.1.5	-2.9040	26.179	0.058538	0.995287
d.1.6	-1.6540	4.881	0.010915	0.084347
sd.d	5.1460	1.867	0.004174	0.026200
beta[2]	1.2361	6.488	0.014509	1.132292
beta[3]	6.4383	3.392	0.007585	0.576225
beta[4]	-0.7476	139.261	0.311397	4.799500
beta[5]	1.7722	81.373	0.181955	3.398466
beta[6]	-8.4963	93.248	0.208509	4.991421

2. Quantiles for each variable:

	2.5%	25%	50%	75%	97.5%
d.1.2	-6.8293	-2.399	-0.56917	1.249	5.617
d.1.3	-9.9394	-6.754	-5.41262	-4.132	-1.125
d.1.4	-14.2462	-5.172	-1.52422	2.129	11.613
d.1.5	-52.2607	-12.981	-3.38063	6.152	55.786
d.1.6	-11.4081	-4.590	-1.69322	1.217	8.459
sd.d	2.5541	3.845	4.79175	6.054	9.786
beta[2]	-9.5725	-3.685	0.75760	5.165	15.634
beta[3]	0.6883	4.027	6.09224	8.475	14.021
beta[4]	-228.5349	-19.038	-0.11935	18.566	212.332
beta[5]	-154.3489	-17.769	0.04431	17.965	191.149
beta[6]	-267.7240	-21.814	-1.17367	17.775	170.818

-- Model fit (residual deviance):

Dbar	pD	DIC
28.25290	27.27184	55.52474

28 data points, ratio 1.009, I^2 = 4%

Frequency

1. Empirical mean and standard deviation for each variable, plus standard error of the mean:

	Mean	SD	Naive SE	Time-series SE
d.1.2	-0.7493	3.604	0.008059	0.04618
d.1.3	-4.5065	2.610	0.005835	0.03069
d.1.4	-3.8149	27.144	0.060695	2.68218
d.1.5	-3.2766	40.382	0.090298	2.07924
d.1.6	12.8579	29.130	0.065137	2.12090
sd.d	5.7165	2.323	0.005194	0.05207
beta[2]	1.5202	6.144	0.013739	2.05077
beta[3]	4.5842	5.407	0.012091	0.60388
beta[4]	-4.7028	54.476	0.121812	5.60773
beta[5]	-0.2878	60.649	0.135616	3.13102
beta[6]	138.4542	265.517	0.593713	24.50683

2. Quantiles for each variable:

	2.5%	25%	50%	75%	97.5%
d.1.2	-8.686	-2.655	-0.6072	1.362	6.0932
d.1.3	-10.130	-5.987	-4.3506	-2.880	0.3141
d.1.4	-60.461	-11.926	-2.1137	7.443	44.4534
d.1.5	-97.842	-17.881	-3.1702	11.867	86.9248
d.1.6	-18.794	-4.736	0.2603	18.829	84.7473
sd.d	2.605	4.108	5.2322	6.777	11.7273
beta[2]	-7.036	-1.916	0.6971	3.153	21.6595
beta[3]	-6.975	1.136	4.9575	8.309	14.5036
beta[4]	-119.848	-17.867	-1.1542	15.033	92.7916
beta[5]	-137.792	-18.745	-0.3204	17.537	144.8557
beta[6]	-117.531	-11.539	8.3265	166.304	799.2862

-- Model fit (residual deviance):

Dbar	pD	DIC
29.02003	27.65391	56.67395

28 data points, ratio 1.036, I^2 = 7%

Intensity

1. Empirical mean and standard deviation for each variable, plus standard error of the mean:

	Mean	SD	Naive SE	Time-series SE
d.1.2	-0.3208	4.304	0.009624	0.07900
d.1.3	-5.5271	2.927	0.006545	0.02329
d.1.4	-3.5194	18.108	0.040491	1.18002
d.1.5	-8.3134	49.515	0.110718	6.31522
d.1.6	-2.0667	6.109	0.013661	0.09206
sd.d	6.8054	2.450	0.005478	0.04633
beta[2]	-0.5968	9.684	0.021653	1.56276
beta[3]	1.3807	4.654	0.010407	0.63109
beta[4]	-6.7224	56.938	0.127317	3.82885
beta[5]	-16.8375	166.351	0.371971	20.63453
beta[6]	2.2116	13.752	0.030751	1.23620

2. Quantiles for each variable:

	2.5%	25%	50%	75%	97.5%
d.1.2	-8.904	-2.912	-0.34354	2.229	8.4657
d.1.3	-11.596	-7.235	-5.45416	-3.754	0.2086
d.1.4	-52.336	-9.857	-1.89190	5.728	26.5852
d.1.5	-85.090	-13.702	-3.42559	6.815	48.9464
d.1.6	-14.154	-5.767	-2.10760	1.511	10.5028
sd.d	3.445	5.076	6.31948	7.997	13.0743
beta[2]	-18.602	-6.589	-1.11532	4.731	22.1422
beta[3]	-8.457	-1.380	1.09995	4.227	10.9737
beta[4]	-170.847	-18.882	-0.57326	16.532	85.2987
beta[5]	-275.011	-18.383	0.08046	18.614	173.8948
beta[6]	-23.956	-6.256	1.57100	10.131	30.8826

-- Model fit (residual deviance):

Dbar	pD	DIC
28.20935	27.55312	55.76247

28 data points, ratio 1.007, I^2 = 4%

Duration

1. Empirical mean and standard deviation for each variable, plus standard error of the mean:

	Mean	SD	Naive SE	Time-series SE
d.1.2	0.5798	6.221	0.013911	0.07922
d.1.3	-4.8710	3.162	0.007071	0.01593
d.1.4	-3.9461	19.878	0.044449	1.73929
d.1.5	-3.5579	15.496	0.034649	0.27860
d.1.6	-2.2788	16.306	0.036462	2.40598
sd.d	7.3199	3.136	0.007013	0.09077
beta[2]	-2.6801	12.542	0.028046	1.93115
beta[3]	6.0030	6.467	0.014460	0.37275
beta[4]	-11.0508	83.599	0.186932	7.98800
beta[5]	-0.0343	98.868	0.221077	2.68488
beta[6]	-3.5561	32.833	0.073416	6.70267

2. Quantiles for each variable:

	2.5%	25%	50%	75%	97.5%
d.1.2	-12.642	-2.990	1.090387	4.403	12.437
d.1.3	-11.664	-6.625	-4.711963	-3.006	1.248
d.1.4	-49.308	-9.394	-2.052721	4.820	26.723
d.1.5	-32.686	-11.662	-3.496361	4.722	25.820
d.1.6	-36.338	-12.390	-2.431034	7.558	31.105
sd.d	2.845	4.995	6.741931	9.059	15.065
beta[2]	-23.372	-11.841	-4.044479	4.519	19.939
beta[3]	-7.108	1.855	6.277181	10.261	18.467
beta[4]	-211.099	-19.997	-1.247831	15.342	109.021
beta[5]	-183.795	-18.786	0.003472	18.632	176.454
beta[6]	-69.979	-23.828	-3.898496	13.285	67.490

-- Model fit (residual deviance):

Dbar	pD	DIC
28.53632	27.84102	56.37734

28 data points, ratio 1.019, I^2 = 5%

Length

Figure S25 The results of meta-regression analyses for inattention

1. Empirical mean and standard deviation for each variable, plus standard error of the mean:

	Mean	SD	Naive SE	Time-series SE
d.1.2	-765.7497	322.75	0.7217	0.5181
d.1.3	203.0258	207.01	0.4629	1.2455
d.1.4	0.8808	384.68	0.8602	1.0512
d.1.5	175.6291	384.45	0.8597	1.5661
d.1.6	-331.2501	304.22	0.6803	0.7678
sd.d	381.5777	53.02	0.1186	0.2129
beta[2]	1375.8814	448.10	1.0020	3.1573
beta[3]	830.3693	460.35	1.0294	45.8009
beta[4]	-55.5421	698.51	1.5619	71.9162
beta[5]	-102.8309	680.50	1.5216	37.4808
beta[6]	-460.6770	1615.18	3.6116	111.4816

2. Quantiles for each variable:

	2.5%	25%	50%	75%	97.5%
d.1.2	-1335.8	-1005.4	-796.2192	-519.4	-147.5
d.1.3	-203.8	65.5	203.1539	338.5	615.2
d.1.4	-762.2	-252.2	0.9565	254.4	763.0
d.1.5	-501.4	-93.7	134.8288	426.4	985.9
d.1.6	-949.2	-529.6	-322.8615	-126.2	249.0
sd.d	238.8	360.9	399.2422	420.7	435.0
beta[2]	650.0	1161.0	1517.6509	1741.3	1810.6
beta[3]	128.8	453.2	761.3566	1169.4	1698.0
beta[4]	-1774.5	-326.8	-12.0002	274.6	1220.2
beta[5]	-864.3	-663.3	-322.2507	305.4	1192.8
beta[6]	-3464.2	-1242.0	-172.9161	896.6	1667.1

-- Model fit (residual deviance):

Dbar	pD	DIC
26.01698	26.01658	52.03356

26 data points, ratio 1.001, I^2 = 4%

1. Empirical mean and standard deviation for each variable, plus standard error of the mean:

	Mean	SD	Naive SE	Time-series SE
d.1.2	132.762	209.6	0.4688	0.4453
d.1.3	-12.647	144.6	0.3234	0.3232
d.1.4	-2.276	348.5	0.7792	5.6318
d.1.5	275.541	236.0	0.5278	1.2007
d.1.6	227.596	894.0	1.9990	0.7175
sd.d	293.973	132.6	0.2964	1.1397
beta[2]	-668.542	661.5	1.4792	8.3149
beta[3]	-367.752	325.7	0.7283	69.7450
beta[4]	-18.942	1130.5	2.5279	285.7163
beta[5]	-674.084	692.6	1.5487	101.8300
beta[6]	-104.112	1549.4	3.4646	5.4004

2. Quantiles for each variable:

	2.5%	25%	50%	75%	97.5%
d.1.2	-311.35	23.88	134.828	248.53	559.21
d.1.3	-321.11	-86.17	-9.645	60.41	291.24
d.1.4	-711.73	-197.28	-16.957	190.93	735.67
d.1.5	-220.59	150.49	282.475	392.60	777.05
d.1.6	-641.77	-420.26	-171.748	771.00	2088.87
sd.d	51.48	184.49	349.846	401.60	433.28
beta[2]	-1399.47	-1268.76	-804.363	-174.30	295.60
beta[3]	-1036.76	-631.15	-284.033	-85.29	82.78
beta[4]	-1743.34	-609.39	-37.844	316.03	3782.31
beta[5]	-2168.57	-1045.81	-620.733	-124.82	424.51
beta[6]	-1349.65	-1315.02	-785.369	446.97	2492.09

-- Model fit (residual deviance):

Dbar	pD	DIC
25.99697	25.99628	51.99325

26 data points, ratio 0.9999, I^2 = 4%

Frequency

1. Empirical mean and standard deviation for each variable, plus standard error of the mean:

	Mean	SD	Naive SE	Time-series SE
d.1.2	-26.842	169.88	0.3799	0.4086
d.1.3	-162.220	167.77	0.3751	0.7733
d.1.4	-55.765	525.68	1.1755	8.5620
d.1.5	439.904	311.04	0.6955	4.3656
d.1.6	1.387	225.76	0.5048	0.5456
sd.d	262.084	90.78	0.2030	0.8559
beta[2]	20.985	349.57	0.7817	10.4803
beta[3]	408.895	299.34	0.6693	17.1421
beta[4]	-220.677	1784.66	3.9906	194.7646
beta[5]	455.421	496.60	1.1104	47.9472
beta[6]	-369.315	353.20	0.7898	15.4733

2. Quantiles for each variable:

	2.5%	25%	50%	75%	97.5%
d.1.2	-353.3	-143.75	-24.250	84.83	310.3
d.1.3	-563.0	-246.13	-133.269	-52.17	109.0
d.1.4	-1186.2	-332.20	6.694	253.91	935.2
d.1.5	-121.1	201.42	450.003	666.08	1029.2
d.1.6	-433.6	-145.70	-4.027	140.90	468.0
sd.d	115.0	187.13	251.741	338.35	425.5
beta[2]	-583.3	-66.85	132.169	262.04	370.7
beta[3]	115.0	199.17	259.590	548.78	960.3
beta[4]	-4239.0	-924.02	118.404	852.48	2289.1
beta[5]	-448.3	-11.21	647.521	871.86	1056.2
beta[6]	-874.9	-671.06	-354.544	-97.13	191.0

-- Model fit (residual deviance):

Dbar	pD	DIC
25.99193	25.99003	51.98196

26 data points, ratio 0.9997, I^2 = 4%

Intensity

1. Empirical mean and standard deviation for each variable, plus standard error of the mean:

	Mean	SD	Naive SE	Time-series SE
d.1.2	132.762	209.6	0.4688	0.4453
d.1.3	-12.647	144.6	0.3234	0.3232
d.1.4	-2.276	348.5	0.7792	5.6318
d.1.5	275.541	236.0	0.5278	1.2007
d.1.6	227.596	894.0	1.9990	0.7175
sd.d	293.973	132.6	0.2964	1.1397
beta[2]	-668.542	661.5	1.4792	8.3149
beta[3]	-367.752	325.7	0.7283	69.7450
beta[4]	-18.942	1130.5	2.5279	285.7163
beta[5]	-674.084	692.6	1.5487	101.8300
beta[6]	-104.112	1549.4	3.4646	5.4004

2. Quantiles for each variable:

	2.5%	25%	50%	75%	97.5%
d.1.2	-311.35	23.88	134.828	248.53	559.21
d.1.3	-321.11	-86.17	-9.645	60.41	291.24
d.1.4	-711.73	-197.28	-16.957	190.93	735.67
d.1.5	-220.59	150.49	282.475	392.60	777.05
d.1.6	-641.77	-420.26	-171.748	771.00	2088.87
sd.d	51.48	184.49	349.846	401.60	433.28
beta[2]	-1399.47	-1268.76	-804.363	-174.30	295.60
beta[3]	-1036.76	-631.15	-284.033	-85.29	82.78
beta[4]	-1743.34	-609.39	-37.844	316.03	3782.31
beta[5]	-2168.57	-1045.81	-620.733	-124.82	424.51
beta[6]	-1349.65	-1315.02	-785.369	446.97	2492.09

-- Model fit (residual deviance):

Dbar	pD	DIC
25.99697	25.99628	51.99325

26 data points, ratio 0.9999, I^2 = 4%

Duration

Length

S15. GRADE assessment for major symptoms

Table S8 Summary of GRADE assessment for the certainty in hyperactivity/ impulsivity

Comparisons	Nature of evidence	Certainty	Reason for downgrading
Closed-skill sports vs. multicomponent	Indirect	Low	Imprecision, indirectness
Closed-skill sports vs. HIIT	Indirect	Low	Imprecision, indirectness
Closed-skill sports vs. exergaming	Indirect	Low	Imprecision, indirectness
Closed-skill sports vs. open-skill sports	Indirect	Low	Imprecision, indirectness
Closed-skill sports vs. control	Mixed	Moderate	Risk of bias
Multicomponent vs. HIIT	Mixed	Low	Imprecision
Multicomponent vs. exergaming	Indirect	Low	Imprecision, indirectness
Multicomponent vs. open-skill sports	Indirect	Low	Imprecision, indirectness
Multicomponent vs. control	Mixed	Low	Imprecision, inconsistency
HIIT vs. exergaming	Indirect	Low	Imprecision, indirectness
HIIT vs. open-skill sports	Indirect	Low	Imprecision, indirectness
HIIT vs. control	Mixed	Very low	Imprecision, inconsistency
Exergaming vs. open-skill sports	Indirect	Low	Imprecision, indirectness
Exergaming vs. control	Mixed	Low	Imprecision, risk of bias
Open-skill sports vs. control	Mixed	Very low	Imprecision, inconsistency

Table S9 Summary of GRADE assessment for the certainty in inattention

Comparisons	Nature of evidence	Certainty	Reason for downgrading
Closed-skill sports vs. HIIT	Indirect	Low	Imprecision, indirectness
Closed-skill sports vs. exergaming	Indirect	Low	Imprecision, indirectness
Closed-skill sports vs. open-skill sports	Indirect	Low	Imprecision, indirectness
Closed-skill sports vs. multicomponent	Indirect	Very low	Imprecision, indirectness
Closed-skill sports vs. control	Mixed	High	No downgrade
HIIT vs. exergaming	Indirect	Low	Imprecision, indirectness
HIIT vs. open-skill sports	Indirect	Low	Imprecision, indirectness
HIIT vs. multicomponent	Mixed	Low	Imprecision
HIIT vs. control	Mixed	Low	Imprecision, risk of bias
Exergaming vs. open-skill sports	Indirect	Low	Imprecision, indirectness
Exergaming vs. multicomponent	Indirect	Low	Imprecision, indirectness
Exergaming vs. control	Mixed	Low	Imprecision, risk of bias
Open-skill sports vs. multicomponent	Indirect	Low	Imprecision, indirectness
Open-skill sports vs. control	Mixed	Very low	Imprecision, inconsistency
Multicomponent vs. control	Mixed	Low	Imprecision, risk of bias

S16. A partially contextualized framework

Table S10 A partially contextualized framework was used for classification of interventions based on network meta-analysis

Outcomes	Classification	Intervention	Effect size	Surface under the cumulative ranking curve	Certainty of evidence
Inhibitory Control	Large beneficial effect	Open-skill activities	1.94 (1.24 to 2.64)	99.1%	High
		Closed-skill activities	1.02 (0.54 to 1.50)	55.2%	Moderate
		Multicomponent PA	1.00 (0.46 to 1.55)	54.4%	Moderate
	Moderate beneficial effect	Exergaming	0.79 (0.00 to 1.59)	40.6%	Low
Working memory	Large beneficial effect	Closed-skill activities	1.21 (-0.22 to 2.65)	75.9%	Moderate
		Multicomponent PA	1.05 (0.19 to 1.92)	71.3%	Moderate
	Moderate beneficial effect	Open-skill activities	0.65 (-1.59 to 2.89)	52.2%	Low
	Trivial to no effect	Exergaming	0.00 (-2.08 to 2.08)	29.7%	Very low

Outcomes	Classification	Intervention	Effect size	Surface under the cumulative ranking curve	Certainty of evidence
Cognitive flexibility	Large beneficial effect	Multicomponent PA	1.44 (-0.19 to 3.07)	70.3%	Moderate
		Open-skill activities	1.43 (-0.24 to 3.11)	70.0%	Low
		Closed-skill activities	1.14 (0.09 to 2.20)	60.6%	Low
	Moderate beneficial effect	Exergaming	0.58 (-1.64 to 2.79)	38.9%	Low
Hyperactivity/impulsivity	Large beneficial effect	Closed-skill activities	-1.60 (-0.32 to -0.19)	72.5%	Moderate
		Multicomponent PA	-1.58 (-3.60 to 0.43)	71.3%	Low
		High-intensity interval training	-0.97 (-3.77 to 1.83)	54.2%	Very low
	Small beneficial effect	Exergaming	-0.28 (-3.96 to 3.40)	40.0%	Low
		Open-skill activities	-0.25 (-4.05 to 3.55)	38.2%	Very low

Outcomes	Classification	Intervention	Effect size	Surface under the cumulative ranking curve	Certainty of evidence
Inattention	Large beneficial effect	Closed-skill activities	-1.51 (-2.33 to -0.69)	96.3%	High
	Small beneficial effect	High-intensity interval training	-0.28 (-1.54 to 0.98)	52.1%	Low
	Trivial to no effect	Exergaming	-0.02 (-1.65 to 1.61)	39.4%	Low
		Multicomponent PA	-0.02 (-0.89 to 0.85)	37.6%	Low
	Small harmful effect	Open-skill activities	0.04 (-1.87 to 1.94)	38.1%	Very low